energy resolution eliminates the need for two, three, etc. different x-ray beam tube voltages needed to create to measurably-different, broad-bandwidth x-ray beam spectra used in dual, triple, etc. energy imaging as well as the associated noise and registration problems. This approach allows us to do tissue transmission "spectroscopy" on a pixel-by-pixel basis (creating multiple energy-dependent images). This is described in the following passages:

P 45: lines 6-8 "If the detector offers energy resolution then an additional calibration can be performed to account for energy resolution.".
P.45: lines 21-22 "This results in a position-dependent, energy-dependent, intensity profile.".
      P.46, lines 5-13 "If the edge-on detector is capable of providing sufficient energy resolution, such as when an energy-resolving detector rather than an integrating detector is utilized, then additional information is available. Each detected photon represents the exponential attenuation properties of the filter, which in the case of mammography is breast tissue. The filter, due to its attenuation properties, modifies the local x-ray beam intensity and spectral distribution at each detector pixel. If the spectral distribution is uniform along the length of the detector then a reasonable comparison of corrected intensity and spectral content between individual pixels in the detected image can be made. What is essentially acquired is a set of overlapping "energy-dependent images" for which the energy dependence is explicitly known.

      Applicants will address the rejection of claim 57 as being anticipated by Spitz (Patent No. 6,362,471). Spitz describes the design of an anthropomorphic calibration phantom that can be used to calibrate the response of a spectroscopic instrument suitable for in vivo measurements of metal (via x-ray fluorescence) or radioactive material contaminants within bone. Spitz discusses the use of a photon source in order to induce x-ray fluorescence that is subsequently detected by the spectroscopic detector. This is not transmission imaging with a broad-band x-ray source used in radiology. Spitz does not need to calibrate the spatial and energy dependence of the source beam. The spectroscopic detector makes emission (fluorescence) measurements used to determine the relative levels of bone contamination.

      The inventors, as previously cited, describe measuring the spatial and energy dependence of the intensity profile of the radiation source. The inventors are calibrating the source x-ray beam and not the level of bone contamination.

      Applicants will address the rejection of claim 57 and 58 as being anticipated by Kump (Patent No. 6,460,003). Kump describes determining a set of weighting coefficients by exposing two digital detectors to (preferably) the same x-ray radiation source. The weighting coefficients are frequency-dependent (he measures MTFs) so that one digital detector will provide a similar visual response to a Radiologist or technician despite having a different physical response to the x-ray beam. A similar concept can be implemented if digital detectors are employed with different x-ray tube sources. All systems can be appropriately weighted to create a desired visual appearance that is uniform for all imaging devices of the same type. Kump does not determine energy

dependence as a function of position or energy dependence at all. Although Kump measures an MTF, since he doesn't measure energy he cannot measure an energy-dependent MTF, MTF(E).

The inventors, as previously cited, describe measuring the spatial and energy dependence of the intensity profile of the radiation source. The inventors are using a detector with energy resolution to calibrate the x-ray source. Furthermore, the inventors use the measured spatial-dependent and energy-dependent information to create MTF(E).

Applicants will address next the rejection of claim 58 as being anticipated by Walters (Patent No. 5,115,394). Walters describes a dual energy method for CT scanning with low and high energy levels S_1 and S_2. Unfortunately, the terminology is misleading since "low" and "high" refer to the x-ray tube voltage or KVP. These are actually two significantly different broad-band energy x-ray spectrums (and not 2 energies). Walters describes in col. 9, lines 2-3 a MTF that is material-dependent and not energy-dependent. That is, the MTF is a synthesis, depending on the filtered combination of photoelectric and Compton components (col. 10, lines 3-14). It is a synthesized MTF that is a mathematical combination of two different broad bandwidth x-ray beams. It represents the synthesized MTF of the final image (which must include the patient or a phantom). It is not the MTF response of the detector to a specific x-ray source.

The inventors, on the other hand, describe a detector MTF(E) that is the result of a single direct measurement (pp.46, lines 13-18) of an x-ray beam source. Synthesis is not involved. Low and high tube voltages are not involved. This MTF(E) can be attained because the detector has energy resolution capability. Since Walters has an analog detector that can only measure the total x-ray intensity he can not determine MTF(E) directly with a single x-ray beam measurement.

CONCLUSION

Applicants respectfully submit that all of the Examiner's rejections have been overcome. Applicants respectfully request that the Examiner reconsider and withdraw the outstanding rejections and allow the present application. Applicants invite the Examiner to telephone the undersigned representative if the Examiner believes that a telephonic interview would advance this case to allowance.

Respectfully submitted,

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